(11)Publication number : 2002-365163
(43)Date of publication of application : 18.12.2002

(51)Int.Cl. G01M 11/00
G02F 1/133

(21)Application number : 2001-172068
(22)Date of filing : 07.06.2001

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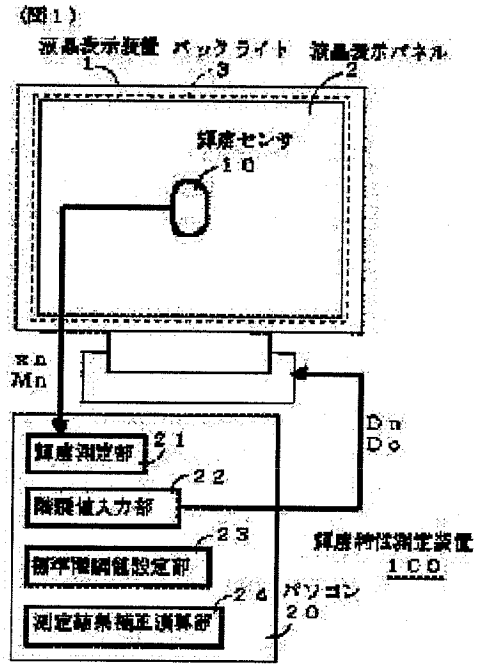
(54) BRIGHTNESS CHARACTERISTIC MEASURING METHOD AND DEVICE OF DISPLAY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To measure the brightness characteristic of a display device without an error, even if base fluctuation is generated in brightness on a screen of the display device during brightness characteristic measurement.
SOLUTION: Reference brightness Mn is measured correlatively with measurement of brightness xn corresponding to each gradation value Dn. Fluctuation of the reference brightness Mn shows the base fluctuation of the brightness on the screen, therefore the brightness xn is corrected based thereon, to acquire the brightness xn having no error. Hereby, the brightness characteristic can be measured without an error, to thereby execute properly gamma correction.



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CLAIMS

[Claim(s)]
[Claim 1]Each gradation value Dn (1 <=n<=N) from the 1st gradation value D1 to the Nth gradation value DN is inputted into a display, It is a luminance characteristic measuring method of a display which measures the luminosity xn of a screen of a display corresponding to each

gradation value Dn, A luminance characteristic measuring method of a display making it respond to measuring the luminosity xn, inputting the standard gradation value Do into a display, measuring standard luminosity Mn, and amending the luminosity xn of a measurement result based on standard luminosity Mn.
[Claim 2]A luminance characteristic measuring method of a display, wherein said display is a liquid crystal display and the liquid crystal display makes a gradation value which gives the brightest luminosity said standard gradation value Do in a luminance characteristic measuring method of the display according to claim 1.
[Claim 3]A luminance property measuring device of a display characterized by comprising the following.
A gradation value input means which inputs each gradation value Dn (1 <=n<=N) from the 1st gradation value D1 to the Nth gradation value DN into a display.
A measurement-of-luminance means to measure the luminance value xn of a screen of a display corresponding to each gradation value Dn.
A gradation value input means which makes it respond to measuring the luminance value xn, and inputs the standard gradation value Do into a display.
A standard measurement-of-luminance means to measure luminance value Mn of a screen of a display corresponding to the standard gradation value Do, and a measurement result compensation means which amends the luminance value xn of a measurement result based on standard luminance value Mn.

[Claim 4]A luminance property measuring device of a display in which said standard gradation value Do is characterized by a liquid crystal display being a gradation value which gives the brightest luminosity in a luminance property measuring device of the display according to claim 3.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the luminance characteristic measuring method and device of a display which can measure the luminance property of a display without error, even if the base fluctuation of luminosity arises during measurement in more detail about the luminance characteristic measuring method and device of a display.
[0002]
[Description of the Prior Art]Conventionally, the luminance property of a liquid crystal display is measured as follows.
(1) Turn on a liquid crystal display and warm up for [for / 20 minutes / -] 30 minutes.
(2) Input the 1st gradation value D1 (for example, "0") - the 256th gradation value D256 (for example, "255") into a liquid crystal display, and measure the luminance values x1-x256 of a

corresponding screen.
(3) Match the 1st gradation value D1 – the 256th gradation value D256, and the luminance values x1–x256 of a measurement result, and consider it as the luminance property of this liquid crystal display.
[0003]The measured luminance property is used when performing a gamma correction.
[0004]
[Problem(s) to be Solved by the Invention]In the luminance characteristic measuring method of the above-mentioned conventional liquid crystal display, while inputting from the 1st gradation value to the 256th gradation value into the liquid crystal display in order and having measured the luminance value, a back light generates heat and temperature rises. However, since the light of a back light will become strong if temperature rises, base fluctuation arises in the luminosity of the screen of a liquid crystal display (luminosity increases), a difference is produced in the measuring condition of the measured value at the time of a measurement start, and the measured value at the time of measuring finish, and there is a problem that an error is included in the luminance property using a measurement result, as it is. Although the temperature of a back light may fall depending on environment, since the light of a back light becomes weak even in this case, base fluctuation arises in the luminosity of the screen of a liquid crystal display (luminosity decreases), and there is the same problem as the above. Then, the purpose of this invention is to provide the luminance characteristic measuring method and device of a display which can measure the luminance property of a display without error, even if the base fluctuation of luminosity arises during measurement.
[0005]
[Means for Solving the Problem]In the 1st viewpoint, this invention inputs each gradation value Dn (1 <=n<=N) from the 1st gradation value D1 to the Nth gradation value DN into a display, It is a luminance characteristic measuring method of a display which measures the luminosity xn of a screen of a display corresponding to each gradation value Dn, It is made to respond to measuring the luminosity xn, the standard gradation value Do is inputted into a display, standard luminosity Mn is measured, and a luminance characteristic measuring method of a display amending the luminosity xn of a measurement result based on standard luminosity Mn is provided. In a luminance characteristic measuring method of a display by the 1st viewpoint of the above, it is made to respond to measuring the luminosity xn corresponding to each gradation value Dn, and standard luminosity Mn is measured. Since change of this standard luminosity Mn expresses base fluctuation of luminosity, if the luminosity xn is amended based on this, it can acquire the luminance property of a display without error.
[0006]In the 2nd viewpoint, in a luminance characteristic measuring method of a display of the above-mentioned composition, said display is a liquid crystal display and this invention provides a luminance characteristic measuring method of a display, wherein the liquid crystal display makes a gradation value which gives the brightest luminosity said standard gradation value Do. Base fluctuation of luminosity of a screen appears notably, so that luminosity is bright. So, in a luminance characteristic measuring method of a display by the 2nd viewpoint of the above, since it inputs into a display by making into the standard gradation value Do a gradation value which gives the brightest luminosity and standard luminosity Mn is measured, base fluctuation of luminosity of a screen can be caught most correctly.
[0007]A luminance property measuring device of a display this invention is characterized by that comprises the following in the 3rd viewpoint.
A gradation value input means which inputs each gradation value Dn (1 <=n<=N) from the 1st gradation value D1 to the Nth gradation value DN into a display.
A measurement-of-luminance means to measure the luminance value xn of a screen of a display corresponding to each gradation value Dn.
A gradation value input means which makes it respond to measuring the luminance value xn, and inputs the standard gradation value Do into a display.
A standard measurement-of-luminance means to measure luminance value Mn of a screen of a display corresponding to the standard gradation value Do, and a measurement result compensation means which amends the luminance value xn of a measurement result based on

standard luminance value Mn.
In a luminance property measuring device of a display by the 3rd viewpoint of the above, a luminance characteristic measuring method of a display by the 1st viewpoint of the above can be enforced suitably.
[0008]In the 4th viewpoint, this invention provides a luminance property measuring device of a display in which said standard gradation value Do is characterized by a liquid crystal display being a gradation value which gives the brightest luminosity in a luminance property measuring device of a display of the above-mentioned composition. In a luminance property measuring device of a display by the 4th viewpoint of the above, a luminance characteristic measuring method of a display by the 2nd viewpoint of the above can be enforced suitably.
[0009]
[Embodiment of the Invention]Hereafter, the embodiment shown in a figure explains this invention still in detail. Thereby, this invention is not limited.
[0010]Drawing 1 is a lineblock diagram showing the luminance property measuring device 100 of the liquid crystal display 1 concerning one embodiment of this invention. This luminance property measuring device 100 possesses the luminance sensor 10 and the personal computer 20, and is constituted. The luminance sensor 10 is installed so that the luminosity of the screen (liquid crystal display panel 2) of the liquid crystal display 1 can be detected. The standard gradation value set part 23 for an operator to set up the standard gradation value Do, as for the personal computer 20, The gradation value input part 22 which inputs each gradation value Dn (1 <=n<=N) and the standard gradation value Do from the 1st gradation value D1 to the Nth gradation value DN into a display, The measurement-of-luminance part 21 which measures luminance value Mn of the screen corresponding to the luminance value xn of the screen corresponding to each gradation value Dn and the standard gradation value Do with the luminance sensor 10, and the measurement result correction operation part 24 which amends the luminance value xn of a measurement result based on standard luminance value Mn are included. It is preferred that the liquid crystal display 1 sets up the gradation value which gives the brightest luminosity as the standard gradation value Do.
[0011]Drawing 2 is a flow chart of the luminance property measuring process by the luminance property measuring device 100. After turning on the liquid crystal display 1, making the back light 3 turn on and warming up for [for / 20 minutes / -] 30 minutes, it is preferred to perform this processing. The standard gradation value Do is inputted into the liquid crystal display 1 in Step S1. Reference luminance value Mo is measured in Step S2. In Step S3, the gradation value number n is initialized to "1." The liquid crystal display 1 makes "1" the gradation value number n of the gradation value which gives the darkest luminosity, The gradation value number n of the gradation value which gives the brightest luminosity shall be made into "256" (=N), there shall be a gradation value which gives 254 steps of middle luminosity among both, and the gradation value number of "2"-"255" shall be assigned to the order which becomes bright at them.
[0012]The n-th gradation value Dn is inputted into the liquid crystal display 1 in step S4. The luminance value xn is measured in Step S5. The standard gradation value Do is inputted into the liquid crystal display 1 in Step S6. Standard luminance value Mn is measured in Step S7.
[0013]In Step S8, the luminosity xn of a measurement result is amended based on standard luminosity Mn. For example, the luminance value Xn after amendment is calculated by the correcting operation of Xn=xnxMo/Mn. In step S9, the gradation value number n, a gradation value, and the luminance value Xn after amendment are made to correspond, and are memorized.

[0014]In Step S10, only "1" **********s the gradation value number n. In Step S11, if it confirms whether the gradation value number n exceeded N (=256), it has not exceeded and it will return and exceed to said step S4, processing will be ended.
[0015]Drawing 3 is a key map of the luminance property data 30 obtained by the above-mentioned luminance property measuring process.
[0016]Drawing 4 is an illustration figure of a graph showing the temporal change and standard luminosity Mo of the luminosity Xn after the luminosity xn and standard luminosity Mn which were measured, and amendment. Since a gradation value increases to time order, the measured

luminosity xn becomes bright and goes. The luminance value x256 corresponding to the gradation value number N= 256 is in agreement with the standard luminosity M256. The luminance value x1 corresponding to the gradation value number n= 1 at the time of a measurement start is in agreement with standard luminosity Mo. Since the measured luminosity xn becomes bright in order, the luminosity Xn after amendment becomes bright in order, and goes. The luminance value X1 after the amendment corresponding to the gradation value number n= 1 at the time of a measurement start is in agreement with the measured luminance value x1 corresponding to the gradation value number n= 1 at the time of a measurement start. The luminance value X256 after the amendment corresponding to the gradation value number N= 256 is in agreement with standard luminosity Mo.

[0017]According to the luminance property measuring device 100 of the above-mentioned liquid crystal display 1, even if base fluctuation arises in the luminosity of the liquid crystal display 1 during luminance property measurement, the luminance property of the liquid crystal display 1 can be measured without error. The measured luminance property is used when performing a gamma correction.

[0018]According to the above-mentioned embodiment, although the liquid crystal display was assumed as a display, this invention is applicable also to displays, such as a CRT display, a plasma display device, and LED display equipment.

[0019]

[Effect of the Invention]According to the luminance characteristic measuring method and device of a display of this invention, even if base fluctuation arises in the luminosity of the screen of a display during luminance property measurement, the luminance property of a display can be measured without error.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a lineblock diagram showing the luminance property measuring device of the liquid crystal display concerning one embodiment of this invention.

[Drawing 2]It is a flow chart showing the luminance property measuring process concerning one embodiment of this invention.

[Drawing 3]It is a key map showing the luminance property data obtained by the luminance property measuring process of this invention.

[Drawing 4]It is an illustration figure of a graph showing the temporal change of the measured luminosity, standard luminosity, and the luminosity after amendment, and standard luminosity.

[Description of Notations]

100 Luminance property measuring device
1 Liquid crystal display
2 Display panel
3 Back light

10 Luminance sensor
20 Personal computer
21 Measurement-of-luminance part
22 Gradation value input part
23 Standard gradation value set part
24 Measurement result correction operation part

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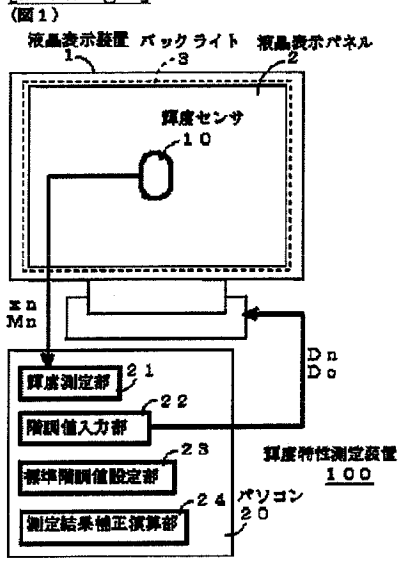
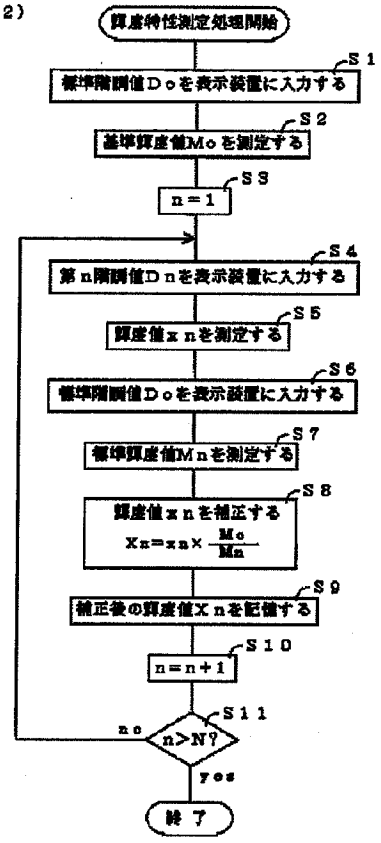
DRAWINGS

[Drawing 1]



[Drawing 2]

(図2)



[Drawing 3]

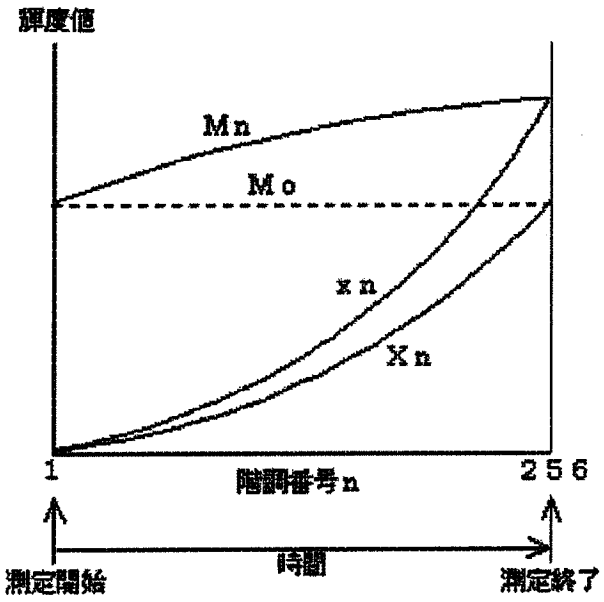
(図3) 輝度特性データ

30

階調値番号n	階調値Dn	輝度Xn
1	D1	X1
2	D2	X2
3	D3	X3
4	D4	X4
5	D5	X5
・ ・ ・	・ ・ ・	・ ・ ・
254	D254	X254
255	D255	X255
256	D256	X256

[Drawing 4]

（図４）



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